PM 1522 II

ENCLOSURE

The following is my understanding gleaned from my discussions with Joe Dobbs and Ravi Prasad on December 8, 1992, in connection with the above identified application.

The discussion lead to an understanding of three fundamental aspects all relating to packing density of tobacco within an impregnator vessel and how the process may work better:

1. the DIET gas process as encompassed by Utsch Patent '250 is apparently an operative upon certain elevated ranges of packing density;

2. that having a pressurization of carbon dioxide include a pre-cooling step or an intermittent cooling step such that carbon dioxide is condensed upon the tobacco, permits effective uniform impregnation at elevated packing densities;

3. that if one imparts a uniform packing density within a tobacco bed located within an impregnator vessel such uniform packing density will provide uniform condensation of CO_2 upon the tobacco and consequently lead to uniform cooling throughout the tobacco bed during venting.

As background to the more detailed discussion which follows, it is to be understood that the impregnator vessel is preferably a cylinder whose longitudinal axis extends vertically and gaseous CO_2 is supplied at the base of the vessel and withdrawn or vented from the top of the vessel.

It had been found that when practicing the gaseous DIET process (See Utsch '250, Col. 6), heat of compression might create higher temperatures at the upper portions of the vessel. We generally read Utsch '250 as teaching at least some flow through cooling of tobacco while pressurizing with the gas, but while maintaining the carbon-dioxide within the gas phase of the pressure/enthalpy phase diagram. The Utech patent does not teach a method including a step wherein condensation is effected upon the tobacco within an impregnator vessel, nor does it teach an additional step such as loading the tobacco at or above an elevated packing density or compacting it to a uniform density at any given packing density.

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Wood has a density of approximately 50 pounds per cubic foot whereas water has a density of approximately 62 pounds per cubic foot.

A. NET is operable at a wider range of packing densities; DIET - gas is not operative at elevated packing densities.

Referring to the drawing marked "Post Vent Temperature Distribution," we have explained in PM 1522 as filed that successful processing of tobacco requires the tobacco to leave the impregnator at a preferred exit temperature, no higher than about 20° F preferably. At that temperature the tobacco has the required degree of stability to retain the impregnated CO_2 for a sufficiently long period of time to undergo expansion.

It has been found that by experimentation and computer modelling, that the DIET-gas process at packing densities 11 pounds per cubic foot or more, the exit temperature of the tobacco will exceed the upper temperature range recited in PM 1522.

We have come to understand this phenomenon as explainable on the following basis. If one loads an impregnator vessel with a charge of tobacco and it undergoes a DIET gas pressurization process, the system results in a substantially gaseous CO_2 about the tobacco. Upon venting, the release of CO_2 and the drop of pressure is the only source of cooling to bring the temperature of the tobacco down to the desired temperature range. At the lower packing densities, there is less total tobacco mass to cool (and secondarily, there may be more room for an additional amount of CO_2 gas). At the elevated packing densities, there is an over abundance of tobacco for the amount of cooling that the release of gas pressure can accommodate.

Fundamentally, with NET the presence of carbon dioxide condensate on the tobacco provides additional cooling that is necessary in order to add the extra cooling necessary to perform well with the elevated packing densities.

Referring now to the drawing entitled "The Effect of Packing Density on Tobacco Temperature undergoing Pressurization," one proceeds from the right hand side of the chart to the left during venting of a pressurized impregnator chamber. One can perceive that the DIET process, the temperature of tobacco for 5.1 pounds per cubic foot and 11 pounds per cubic foot diverge during the venting process to arrive at different exit temperatures.

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In contrast, it is expected that with the presence of condensed CO_2 at the beginning of the venting step, NET tobacco during venting would behave very similarly irrespective of the degree of packing density (within certain limitations). In other words, fundamentally, the NET process with the condensing step, removes packing density as an obstacle and as a factor in the behavior of tobacco with respect to the exit temperature.

Accordingly, the NET process can be used at packing densities at 11 pounds per cubic foot or more and offer the proportional increases in production rates.

We should explore therefore the feasibility of claiming a DIET process with recites further that tobacco is loaded into an impregnator vessel at an elevated packing density (however that may be defined perhaps 11 pounds per cubic foot or above or the like).

Additionally, it has been found that if steps are taken during the loading of tobacco into an impregnator vessel to assure uniform packing density that condensation throughout the bed of tobacco is made more uniform and hence cooling during the venting step occurs on a more uniform basis throughout the tobacco bed. It is envisioned that such uniformity can be achieved by simply compressing the tobacco with a piston arrangement. Sketches have or will be provided showing such arrangement. We should consider a process claim for the new application which includes NET process steps with the additional step of compressing tobacco upon loading an impregnator vessel so as to impart a more uniform packing density (or some other claim structure going to the general concept as described).

B. Short Cycle Aspects of the Present Invention.

My understanding so far is that cycle time can not be so dramatically altered in the pressurization of a tobacco-carbon dioxide system, but please check with the inventors.

Apparently soak time can be reduced to almost zero if elevated pressures (800 to 850 psi) are achieved.

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Referring to the chart entitled "The Effect of Vent Rate on Tobacco Temperature," we have discovered that when the goal is to have the tobacco achieve a certain exit temperature at the conclusion of the venting step, under the NET process, including at least some condensate on the tobacco, it matters not how long or short the venting process takes.

Accordingly, the process can be configured to execute the venting step as quickly as physically practicable, consequently cycle time can be reduced.

SUMMARY

Please prepare at least an outline if not a first draft of the application as quickly as possible based on the above information and the comments from the inventors.

To that end, please do not hesitate to talk to the inventors and/or people knowledgeable of the system, which includes:

Dr. Cho (Ext. 3550)
Barry Fischer (Ext. 3174)
Joe Dobbs (Ext. 4308)
Diane Leister (Ext. 5135)
Ravi Prasad (Ext. 5715).

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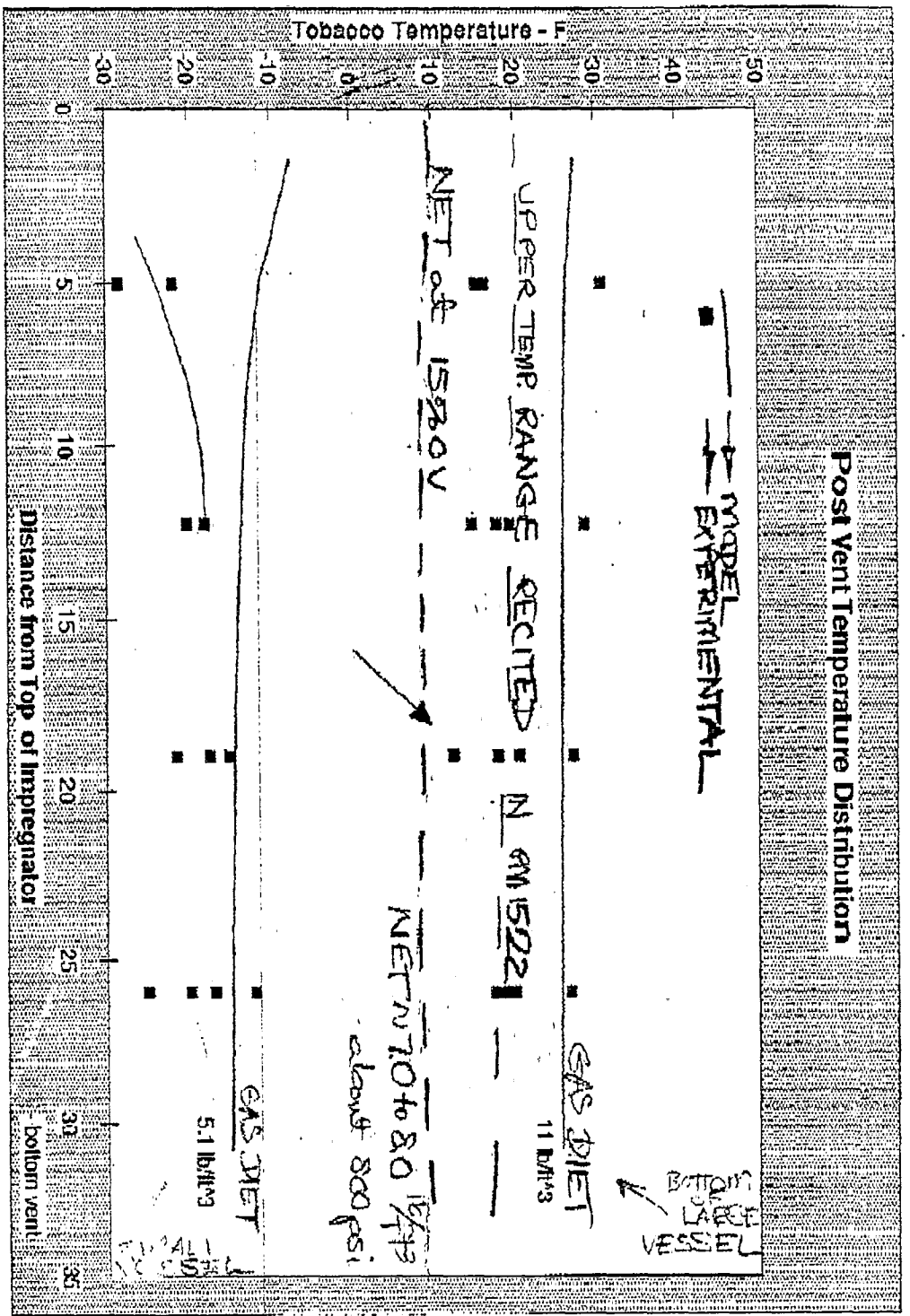

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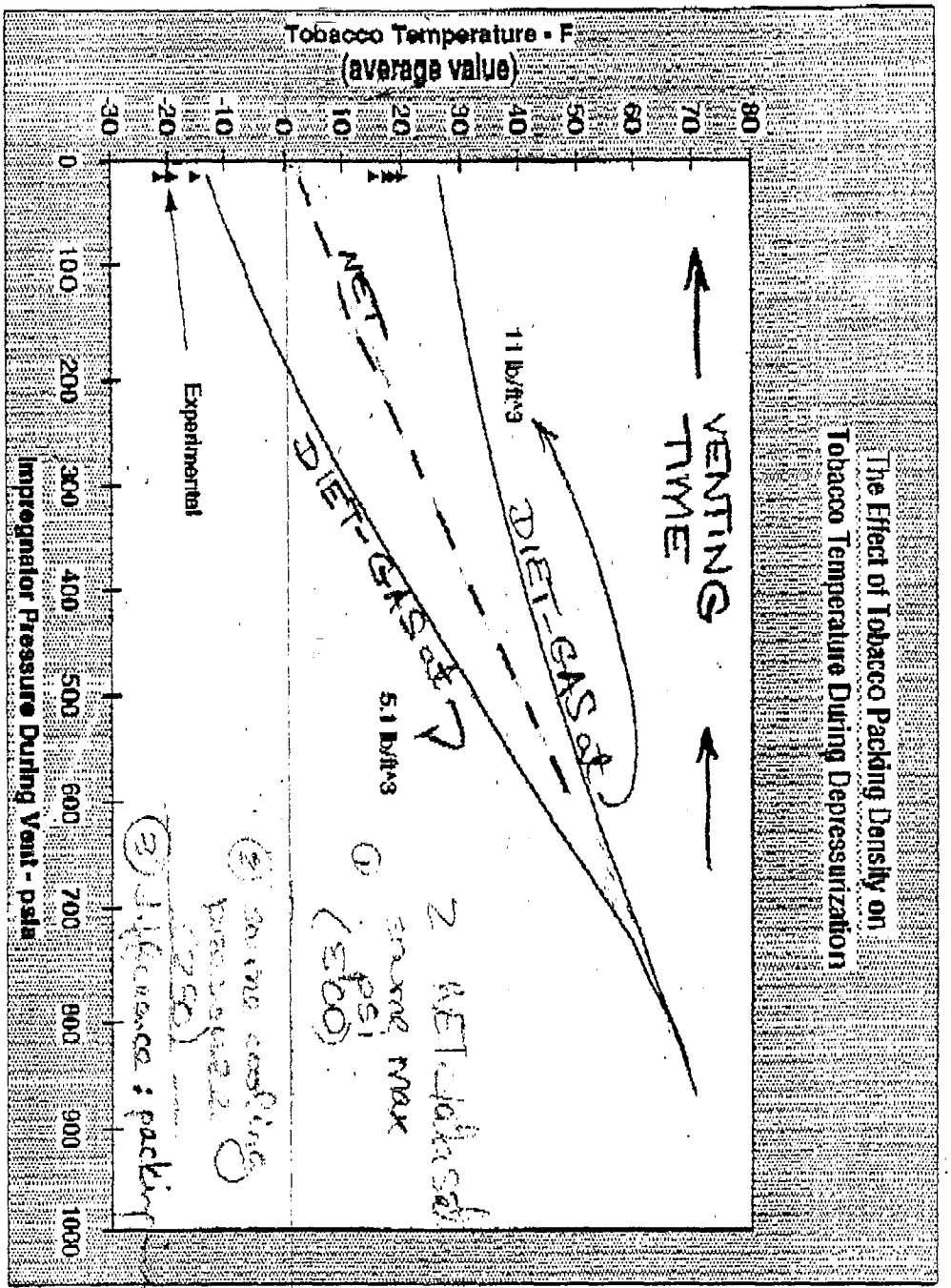

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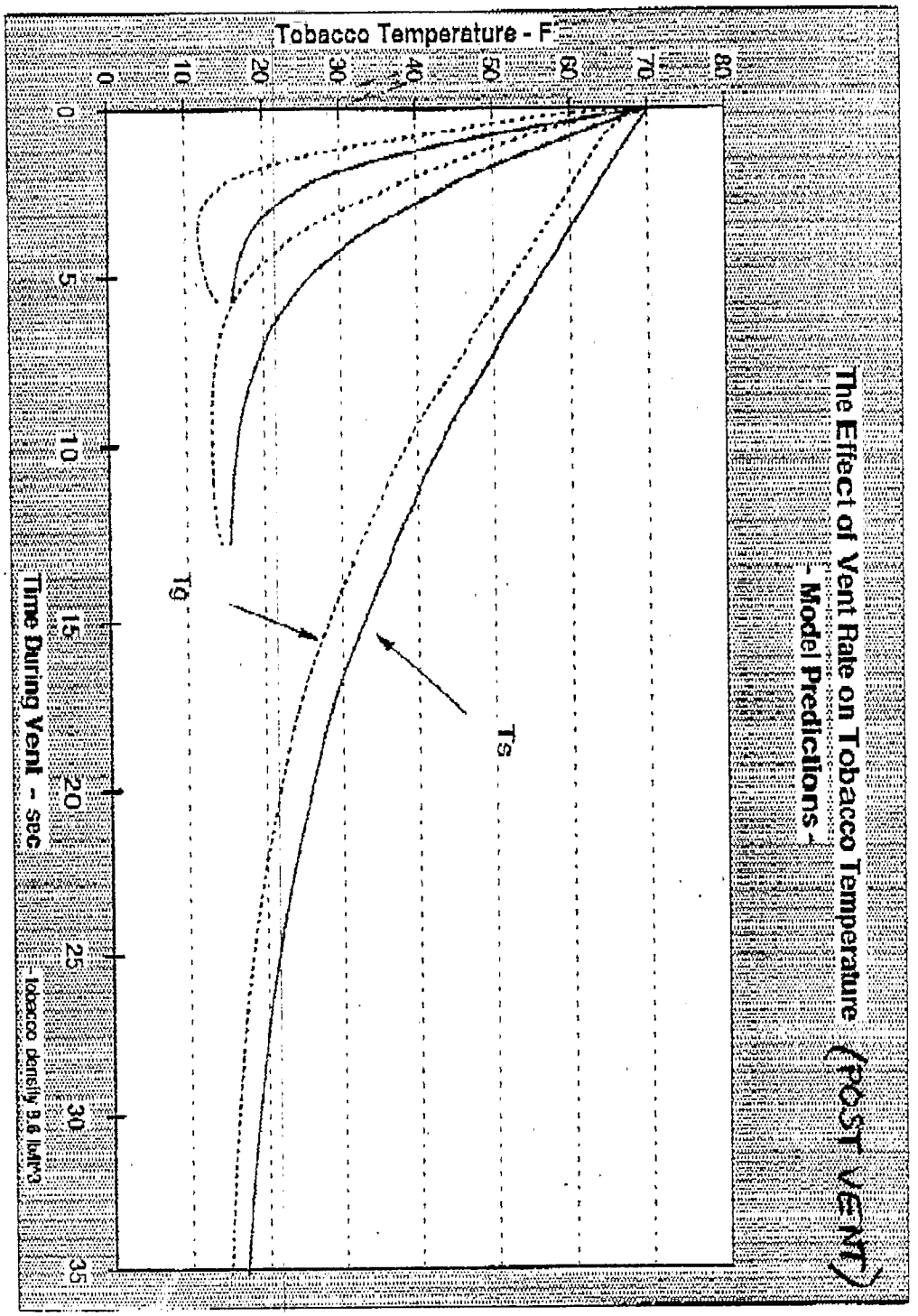

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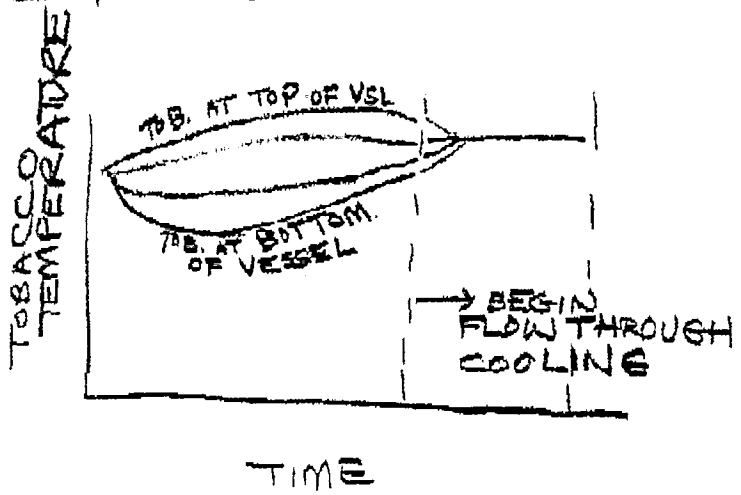
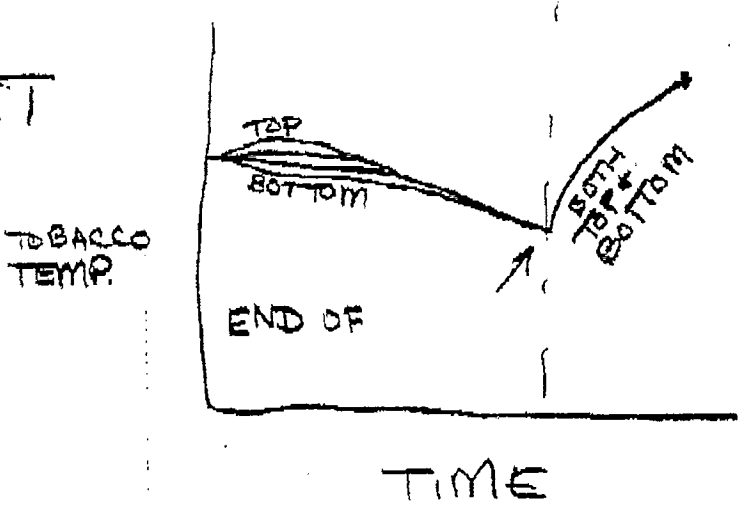
PRESSURIZATION per J. Dobbs

DIET GAS PROCESS



NET



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